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An Implementation of Sign Language Learning Application (SIGNLA)

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Abstract – Hand gesture is one of the methods used in sign language for non-verbal communication. It is most commonly used by deaf & dumb people who have hearing or speech problems to communicate among themselves or with normal people. Various sign language systems had been developed by many makers around the world but they are neither flexible nor cost-effective for the end users. Hence, it is a software which presents a system prototype that is able to automatically recognize and teach sign language to help deaf and dumb people to communicate more effectively with each other or normal people. Dumb people are usually deprived of normal communication with other people in the society, also normal people find it difficult to understand and communicate with them. These people have to rely on an interpreter or on some sort of visual communication. An interpreter won't be always available and visual communication is mostly difficult to understand. Sign Language is the primary means of communication in the deaf and dumb community. As a normal person is unaware of the grammar or meaning of various gestures that are part of a sign language, it is primarily limited to their families and/or deaf and dumb community. Many times, Parents get problems to teach their dumb and deaf child if parents are normal. To solve this problem, we have develop a SignLA application. SignLA application is user friendly. There are two parts of SignLa. One is for students and one is for admin. Students can learn alphabets,numbers, food name etc with sign languages and audio. Students can also attend quizes and check their progress. The another part of this application is admin. Admin can add new videos of images related to particular topic and quizes also with four options.

INTRODUCTION

Sign language is the mode of communication which uses visual ways like expressions, hand gestures, and body movements to convey meaning. Sign language is extremely helpful for people who face difficulty with hearing or speaking. Sign language recognition refers to the conversion of these gestures into words or alphabets of existing formally spoken languages. Thus, conversion of sign language into words by an algorithm or a model can help bridge the gap between people with hearing or speaking impairment and the rest of the world. Vision-based hand gesture recognition is an area of active current research in computer vision and machine learning. Being a natural way of human interaction, it is an area where many researchers are working on, with the goal of making human computer interaction (HCI) easier and natural, without the need for any extra devices. So, the primary goal of gesture recognition research is to create systems, which can identify specific human gestures and use them, for example, to convey information. For that, vision-based hand gesture interfaces require fast and extremely robust hand detection, and gesture recognition in real time. Hand gestures are a powerful human communication modality with lots of potential applications and in this context, we have sign language recognition, the communication method of deaf people. Hand gesture recognition for human computer interaction is an area of active research in computer vision and machine learning. One of its primary goals is to create systems, which can identify specific gestures and use them to convey information or to control a device. Though, gestures need to be modeled in the spatial and temporal domains, where a hand posture is the static structure of the hand and a gesture is the dynamic movement of the hand. There are basically two types of approaches for hand gesture recognition: vision-based approaches and data glove approaches. This work main focus is on creating a vision-based system able to do real-time sign language recognition. The reason for choosing a system based on vision relates to the fact that it provides a simpler and more intuitive way of communication between a human and a computer. Being hand-pose one of the most important communication tools in human's daily life, and with the continuous advances of image and video processing techniques, research on human-machine interaction through gesture recognition led to the use of such technology in a very broad range of applications, like touch screens, video game consoles, virtual reality, medical applications, and sign language recognition. Although sign language is the most natural way of exchanging information among deaf people it has been observed that they are facing difficulties with normal people interaction. Sign language consists of vocabulary of signs in exactly the same way as spoken language consists of a vocabulary of words. Sign languages

are not standard and universal and the grammars differ from country to country.

METHODOLOGY

Learning Application (SignLA) has two phases. One is Admin phase and another is users phase.Several operations can be performed in admin phase regarding updation in the applications.User can learn about gesture ,postion for particular topic.

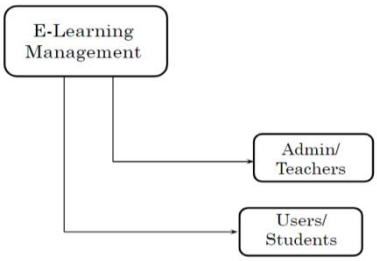

Fig 1.E-Learning Management

In the admin Phase admin have to login with their login id.They can add Notes and Syllabus if admin want to add new Topic.They can update Assignments,Tutorial and Quiz's with respect to courses.admin can also add Educational Videos for easy Understanding.

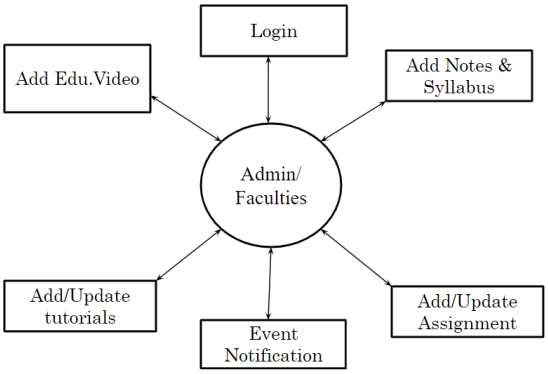

Fig 2. Admin / Faculties

To use this application user have to register or sign-in themselves.Using Sign-in information,user can login.User can learn Alphabets,Numbers,Food Names,Greetings,Finger Spelling,Daily Life symbols etc in the learning Phase.They can attempt quiz's after learning particular topic.Student can check their progress based on the performance in the quiz's.

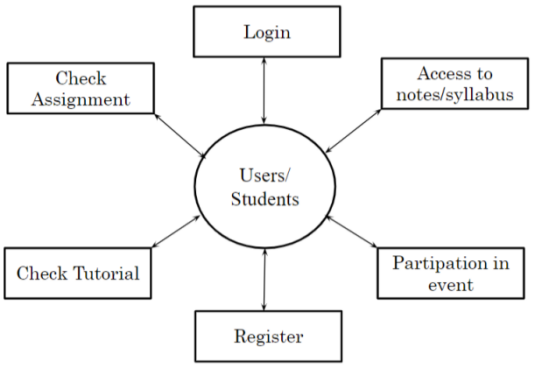

Fig 3.Users/Students

The focus on this framework is on a smartphone platform, where several known conditions of sign language input are utilized to simplify the overall complexity. Firstly, the hand gestures of signer is always placed in the middle of the image frame in order for the whole hand to fit in. Next, the variation of distance between the hand gesture and the camera are limited to a certain range. Application of an appropriate scale invariant technique eliminates the need to normalize size of hand gesture. We utilized these conditions where the sure foreground and sure-background pixels can be determined, and hence the seeded region growing method is suitable to be used in the segmentation stage. Canny edge detection is used to extract the edges of hand gestures for feature extraction phase, which are also utilized as a limiting boundary of seeded region growing to improve segmentation accuracy.The extra Feature of SignLA Application is user can practice with AI camera.The flowchart for the different phases can be described as:

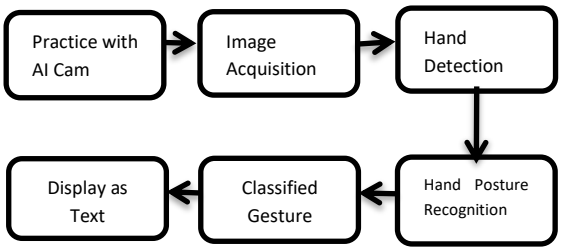

Fig 4.Different Phases in Practice with AI Cam

The Detailed explanation of the above mention step are:

1.Practice with AI Cam: User have to click on the practice with a AI cam option.

2.Image Acquisition: The camera is used to caputrinig the gesture of users hand,So application can use it as input.

3.Hand Detection : In this phase users hand can be detect for the following process from the overall screen users hand should be detect to recognize the sign gesture.

4.Hand Posture Recognition: The pre-process gesture should be recognize to provide output.In this process users gesture is compared with stored gesture in the database to provide the output.

5.Display as Text: In the previous process output has generated.The generated output display on the screen with the Green Color.

ALGORITHM

The steps involved in building a Deep Neural Network (DNN) can be summarized as follows:

Problem Definition: Define the problem that needs to be solved, and decide which type of DNN architecture would be suitable for it.

Data Collection: Collect the relevant data for training and testing the DNN model.

Data Preprocessing: Prepare the data by cleaning and normalizing it so that it can be fed into the DNN.

Building the Model: Define the architecture of the DNN by choosing the number of layers, the type of layers, and the activation functions.

Compilation: Compile the model by specifying the optimizer, loss function, and metrics to be used during the training process.

Training: Train the DNN model on the preprocessed data by adjusting the weights and biases of the network to minimize the loss.

Validation: Evaluate the performance of the model on a validation set, which is a subset of the training data, to avoid overfitting.

Hyperparameter Tuning: Experiment with different hyperparameters, such as the learning rate and batch size, to find the best values for the specific problem.

Testing: Evaluate the performance of the model on the test data to determine the accuracy of the model on unseen data.

Deployment: Deploy the DNN model in a real-world application and use it to make predictions.

Maintenance: Regularly monitor the performance of the DNN model and update it as needed to improve its accuracy and avoid degradation over time.

RESULT

Fig a. Explanation of Learning

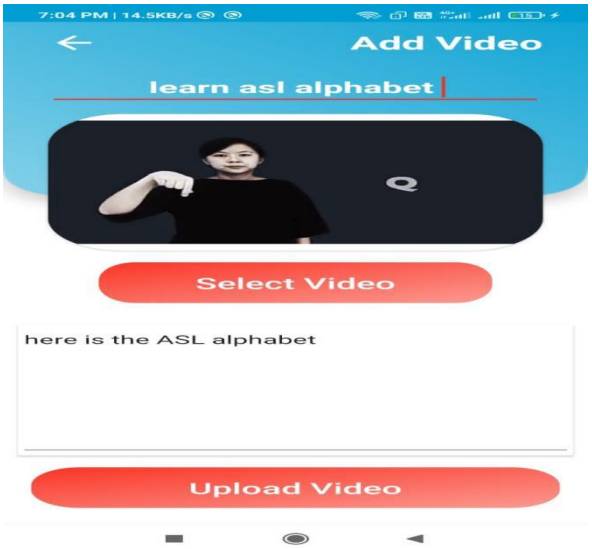

Fig b. Videos Lectures

Fig C. Sample in Database generated in 26 alphabets

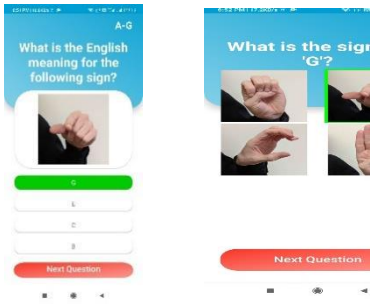

Fig d. Quiz to test the user

CONCLUSION

Through this paper, we are trying to make learning process easy for deaf and dumb people. We have used Deep Natural Network algorithm for managing multiple dimensional database and recognizing various symbol. This application is able to support educational system for deaf and dumb people as well as admin can add or update educational videos and quizes.

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